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Exhibit R-2, PB 2010 Army RDT&E Budget Item Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research					R-1 ITEM NOMENCLATURE PE 0602709A NIGHT VISION TECHNOLOGY					
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	34.440	46.691	26.893						Continuing	Continuing
H95: Night Vision and Electro-Optic Technology	24.005	25.562	26.893						Continuing	Continuing
K90: NIGHT VISION COMPONENT TECHNOLOGY (CA)	10.435	21.129	.000						Continuing	Continuing
A. Mission Description and Budget Item Justification										
Efforts in this program element (PE) design, develop and apply core night vision and electronic sensor technologies to improve the Army's capability to operate in all battlefield conditions. Technologies pursued in this PE have potential to provide the Army with new, or enhanced, capabilities to see and target farther on the battlefield, operate in obscured conditions, and maintain a higher degree of situational awareness (SA). Project H95 researches new infrared (IR) Focal Plane Array (FPA) technologies, assesses and evaluates materials and develops designs for advanced multi-function lasers for designation and range finding, and develops modeling and simulation for advanced sensor technologies. Project K90 funds congressional special interest items.										
Work in this PE is related to and is fully coordinated with PE 0602705A (Electronics and Electronic Devices), PE 0602712A (Countermining Technology), and PE 0603710A (Night Vision Advanced Technology).										
The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.										
Work in this PE is performed by the Army Research, Development, and Engineering Command/Communications-Electronics Research, Development, and Engineering Center (CERDEC)/Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.										

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APPROPRIATION/BUDGET ACTIVITY		R-1 ITEM NOMENCLATURE		
2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research		PE 0602709A NIGHT VISION TECHNOLOGY		
B. Program Change Summary (\$ in Millions)				
	FY 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget	34.924	25.647	26.381	
Current BES/President's Budget	34.440	46.691	26.893	
Total Adjustments	-.484	21.044	.512	
Congressional Program Reductions	.000	-.156		
Congressional Rescissions	.000	.000		
Total Congressional Increases	.000	21.200		
Total Reprogrammings	-.484	.000		
SBIR/STTR Transfer	.000	.000		
Change Summary Explanation				
FY09 funding increase is due to congressional adds.				

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APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602709A NIGHT VISION TECHNOLOGY					PROJECT NUMBER H95	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
H95: Night Vision and Electro-Optic Technology	24.005	25.562	26.893						Continuing	Continuing

A. Mission Description and Budget Item Justification

Efforts in this project research and develop component technologies that enable improved situational awareness (SA) at an affordable price. Component technologies include novel focal plane arrays (FPAs), processing and electronics improvements and modeling and simulation to predict performance and shape design. This research will focus on efforts that benefit the Warfighter using novel affordable large format long wave infrared (LWIR) and visible near infrared (VISNIR) imagery for the Warfighter in all day/night visibility conditions. This research will focus on depositing HgCdTe on low cost substrates, e.g., Si or GaAs as an alternative to CdZnTe, enabling very large format FPAs, and multi-spectral sensors at costs not attainable with current technology. Alternatively, research to find other viable technologies will be examined such as corrugated large format (2k x 2k) corrugated-quantum well infrared photodetectors (C-QUIPS) and type II Strained Layer Superlattice that offer potential performance comparable to or exceeding HgCdTe at higher operating temperature and will also result in a low-cost system. With the development of multispectral and hyperspectral algorithms, advanced dual band FPAs are being developed with on-chip hyperspectral functionality. These FPAs offer the Warfighter the ability to perform detection, identification, and signature identification at extended ranges as well as the ability to detect targets in "deep hide".

Work in this project is related to and is fully coordinated with PE 0602705A (Electronics and Electronic Devices), PE 0602712A (Countermeasure Technology), and PE 0603710A (Night Vision Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is performed by the Army Research, Development, and Engineering Command/Communications-Electronics Research, Development, and Engineering Center (CERDEC)/Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

B. Accomplishments/Planned Program (\$ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
Modeling, Measurements and Simulation Applied Research for Sensor Design and Evaluation: This effort develops and investigates supporting engineering models, measurement techniques, and simulations concurrently with the development and transition of core sensor technologies. In FY08, designed, validated and delivered an aided target recognition performance model for use in combat simulations; developed a flash signature library and discrimination model for sensor design and combat simulations.	4.987	4.987	5.083	

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B. Accomplishments/Planned Program (\$ in Millions)		FY 2008	FY 2009	FY 2010	FY 2011
In FY09, incorporate into the family of models and further study the ability to predict the range performance benefits of advanced signal processing (turbulence reduction, contrast enhancement, super resolution, compression, dither and image fusion) as new image processing techniques are enhanced or developed; develop and validate model for laser range gated active systems, and short wave infrared passive sensors; begin the development of a persistent surveillance model for air to ground systems. In FY10, will complete the development and validation of an air to ground persistent surveillance model; will develop and validate sensor performance model improvements to more accurately address the search process to include; moving targets, moving observers, environmental effects such as glint (reflective components, and complex clutter (foliage and urban structures)).					
Small Business Innovative Research/Small Business Technology Transfer Programs		.000	.202	.000	
High Performance Small Pixel Uncooled Focal Plane Array (FPA): This effort researches high performance small pixel uncooled LWIR technology with the objective of using large format arrays to increase recognition and identification ranges. In FY10, will investigate and develop high definition format uncooled FPA material structures enabling greater sensitivity, lower noise and faster time constants than current sensors.		.000	.000	2.479	
Distributed Aided Target Recognition (AiTR) Evaluation Center of Excellence: This effort researches a Defense-wide virtual/distributed capability to interactively process both real and generated 3-D multispectral scenes from sensors simulations for evaluation of automatic target recognition (ATR) algorithms against realistic operational scenarios in aided or fully autonomous reconnaissance, surveillance, and target acquisition (RSTA) missions to include roadside threats/ explosively formed projectiles. In FY08, conducted four field demonstrations and evaluated the effectiveness of the ATR algorithms using single and multiband (mid wave and long wave) ground based sensors against man-made and natural cluttered environments for stationary and mobile target detection and identification. In FY09, complete data collection and evaluation efforts for assessment of algorithm performance. In FY10, will continue testing of fused multiple ground-based sensors; will investigate and develop hyperspectral and multi-spectral sensors.		1.247	1.220	1.305	
Low Cost High Resolution Focal Plane Arrays (FPA): This effort investigates new infrared focal plane array (IR FPA) technologies for both cooled, high performance IR FPAs and uncooled, low cost IR FPAs.		3.559	3.323	.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011	
In FY08, investigated 2-color, midwave infrared/longwave infrared (MWIR/LWIR) arrays on low cost silicon substrates with pixel operability of greater than 90 percent and 96 percent respectively for both threat warning and enhanced situational awareness; began development of 1024x768 read out integrated circuits for 17 micron uncooled focal plane arrays and researched a 1024x768 array with 6 ms time constant. In FY09, integrate and refine sensor development to achieve pixel operability for 2-color midwave/longwave (MWIR/LWIR) sensor arrays on silicon substrates to greater than 95 percent/98 percent respectively; advance current FPA design to increase image resolution for mini-unmanned air system applications for target identification and tracking at extended ranges.					
Advanced Multifunction Laser Technology: This effort investigates and evaluates laser architectures and materials required to produce multiple wavelength bands and pulse modulation formats for future laser-based systems, including laser designation, range finding, explosive detection and warning lasers. In FY08, developed and evaluated laser designs and materials for a multi-function (2 band) laser system, including laser designation and range finding. In FY09, develop and validate performance of the laser designator and laser rangefinder components in a relevant environment, test laser energy, beam quality, pulse duration and timing jitter under relevant temperature range. In FY10, will complete component testing and integrate laser components (to include optical receivers and electronics suitable for small unmanned aerial sensors and lightweight Soldier applications) into multi-function brass-board system. Related work in this technology area is also being performed under a manufacturing technology effort in PE 0708045A.	2.978	3.139	4.171		
Soldier Sensor Component and Signal Processing: This effort investigates new digital image intensified (I2) components to improve maneuver and situational awareness for the dismounted and mounted Soldier, benefiting pilotage, unmanned aerial systems and unmanned ground vehicle (UGV) applications. In FY08, developed and evaluated co-location of sensor focal plane array and processing resources on the same chip; evaluated high resolution low power pixel mosaic structure display for infrared, hyperspectral, and visible sensors; conducted evaluation and design trade study of advanced adaptive light weight optics for hands-free focus operations. Conducted demonstration of compression algorithm in field programmable gated array micro-core environment. In FY09, complete co-location of sensing and processing resources on same chip allowing for immediate feedback of processing results to enable real-time clutter rejection for hyperspectral and multispectral applications; complete design and fabricate demonstrator of advanced pixel mosaic, high resolution, low light visible sensor display; fabricate and evaluate brassboard advanced adaptive optics.	6.367	7.778	6.808		

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B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010
In FY10, will investigate and develop a brass-board sensor, objective lens and monochrome display with field programmable gated array image processing.					
Advanced Structures for Cooled Infrared (IR) Sensors: This effort researches new detector materials and substrates and develops technologies to minimize detector defects and increase reliability through new growth and substrate preparation techniques. In FY08, evaluated and developed 2-color 256x256 longwave infrared (LWIR) and 640x480 mid-wave infrared (MWIR). In FY09, research an increase in 1k x 1k quantum well infrared photodetector focal plane array quantum efficiency; investigate dual band HgCdTe arrays produced on alternate substrates with 99% operability. In FY10, will develop and evaluate large area high performance dual color (midwave/longwave) infrared FPAs grown on low cost substrates such that defective pixels are reduced to less than 1%.			4.867	4.913	4.334
Compact Hyperspectral Imaging (HSI) Component Technology: This effort investigates hyperspectral focal plane arrays and sensors for ground and air based platforms, and will potentially possess the capability to detect targets and discriminate from clutter for overwatch scenarios, while ground-based hyperspectral sensors can detect targets from clutter in close-in urban situations. In FY10, will develop a hyperspectral imaging (HSI) program to investigate advanced focal plane arrays in the visible, near and long wave IR region, incorporating on-chip multispectral capability via novel processing, to assist in identification of difficult military significant targets in urban and rural environments; will investigate and select best HSI configurations for visible and near IR and long wave IR HSI, including FPAs.			.000	.000	2.713
Total			24.005	25.562	26.893
C. Other Program Funding Summary (\$ in Millions) N/A					
D. Acquisition Strategy N/A					
E. Performance Metrics Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.					

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COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
K90: NIGHT VISION COMPONENT TECHNOLOGY (CA)	10.435	21.129	.000						Continuing	Continuing
<u>A. Mission Description and Budget Item Justification</u> Congressional Interest Item funding for Night Vision Component Technology applied research.										
<u>B. Accomplishments/Planned Program (\$ in Millions)</u>							FY 2008	FY 2009	FY 2010	FY 2011
Enhanced Micro-Image Display Technology							1.545	.000	.000	
Miniaturized Sensors for Small and Tactical Unmanned Aerial Vehicles (MINISENS)							.966	1.163	.000	
Power Efficient Microdisplay Development for US Army Night Vision							2.319	.000	.000	
Small Business Infrared Materials Manufacturing - Silicon Alternatives							1.545	5.425	.000	
Hyperspectral Sensor for UAV Surveillance/Targeting							1.545	.000	.000	
Next Generation Communications System							.967	1.163	.000	
Personal Miniature Thermal Viewer (PMTV)							.774	.000	.000	
Robotics Workforce and Military Curriculum							.774	.000	.000	
Lightweight Polymer Designs for Soldier Combat Optics							.000	1.162	.000	
Uncooled Metal-Oxide Semiconductor Field-Effect Transistor (MOSFET) Embedded Micro-cantilevers							.000	2.325	.000	
Night Vision Technology Research							.000	9.300	.000	
SBIR/STTR							.000	.591	.000	
Total							10.435	21.129	.000	
<u>C. Other Program Funding Summary (\$ in Millions)</u> N/A										

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<u>D. Acquisition Strategy</u> N/A <u>E. Performance Metrics</u> Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.		

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